American National Standard

specification for general purpose cards for information processing

X3.11-1969

american national standards institute, inc.
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American National Standard Specification for General Purpose Paper Cards for Information Processing

Sponsor
Business Equipment Manufacturers Association

Approved October 1, 1969
American National Standards Institute, Inc

American National Standard

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Foreword

(This Foreword is not a part of American National Standard Specification for General Purpose Paper Cards for Information Processing, X3.11-1969.)

This publication is one of a series of standards relating to information interchange between information processing systems, communications systems, and associated equipment through the medium of punched paper cards. This standard specifies the dimensions, quality of paper, and test methods of 7⅜-inch length cards for information processing. Specifications for cards of other length, code representation, and size, shape, and location of holes are not included.

The present standard is a revision of American Standard Specification for General Purpose Paper Cards for Information Processing, X3.11-1966. (The American Standards Association, which published the original document, has been reconstituted as the American National Standards Institute, and American Standards are now designated American National Standards.) The principal changes in this revision concern the requirements and test methods for the stiffness, smoothness, and folding endurance of the cards.

This standard was developed by a group of highly qualified and experienced punched-card specialists representing manufacturers and users of card stock, cards, and card processing equipment. Adherence to this standard will eliminate many misunderstandings.

Suggestions for improvement gained in the use of this standard will be welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

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It should be recognized that although the members of X3.2.3A are variously affiliated, work on the Task Group is based primarily on individual competence and experience. With few exceptions, the above have been continuously active since this work was initiated under the Electronic Industries Association.

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Appendix 11

American National Standard Specification for

General Purpose Paper Cards for Information Processing

1. Scope

This standard specifies the quality of paper, dimensions and quality of general purpose cards, and test methods for general purpose cards of $7\frac{3}{8}$-inch length. This standard is intended to apply to general purpose cards in which the primary method of recording information is by punched holes. This standard is not intended to exclude the use of such cards in other applications.

2. Detail Requirements

Cards shall meet the following requirements when conditioned at 50 percent relative humidity and 73°F, unless otherwise noted. Tolerances for humidity and temperature are ± 2 percent rh and ± 3.5°F. (See 4.1 and Fig. 1.)

2.1 Card Edge

2.1.1 ***Condition.*** All edges shall be smooth and free from burrs.

2.1.2 ***Straightness.*** All edges shall fall between two straight, parallel lines 0.003 inch apart.

2.1.3 ***Parallelism.*** Opposite edges shall be parallel within 0.003 inch.

2.1.4 ***Squareness.*** All angles formed by adjacent sides shall be 90 degrees ± 5 minutes (0.0047 inch at 3.2500 inches).

2.2 Card Dimensions. All edges of the card, except as modified by 2.3, shall fall between two concentric, similarly aligned parallelograms dimensioned as follows:

Outer

Height	3.257 inches
Base length	7.380 inches

Inner

Height	3.247 inches
Base length	7.370 inches

Angles

90 degrees ± 5 minutes
(0.0047 inch at 3.2500 inches)

2.3 Corners

2.3.1 ***Diagonal Corner Cut.*** The corner cut shall remove 0.250 inch ± 0.016 inch from the long edge and 0.433 ± 0.016 inch from the short edge of the card (at a reference angle of 60 degrees to the long edge of the card.)

2.3.1.1 *Preferred Location.* The preferred location for the cut shall be at the upper left corner.

2.3.1.2 *Alternate Location.* An alternate location for the cut shall be at the upper right corner.

2.3.2 ***Other Corners***

2.3.2.1 *Preferred Corners.* All corners, except the diagonally cut corner, shall be square. (See 2.1.4 and Fig. 1.)

2.3.2.2 *Alternate Corners.* All corners, except the diagonally cut corner shall be rounded to a nominal radius of 0.250 inch. The edge of the rounded corner shall fall between two concentric arcs. The center of the arcs is located 0.242 ± 0.000 inch from the long edge and 0.250 ± 0.000 inch from the short edge of the card.

The inner arc shall be 92 degrees and shall have a radius of 0.242 inch; the outer arch shall have a radius of 0.272 inch. (See Fig. 2.)

2.4 Grain. The grain of the paper shall be in the direction of the card length.

2.5 Defects. Cards shall be free from defects which may cause excessive wear or interfere with the normal operation of data processing equipment. These defects are: holes, electrically conductive particles, loose dust, fuzz, abrasive materials, residual chemicals, static charges, and slime spots.

2.6 Printing. Printing shall be legible, without excess ink, and cause no embossment or distortion of the card. The ink shall be nonconductive, nonabrasive, and nonblocking when dry, and shall not transfer to feed rolls, contact rolls, or brushes of data processing machines.

2.7 Curl. The maximum curl of cards, when at equilibrium with any relative humidity between 20 percent and 75 percent, shall not exceed the following values when tested according to 4.2.

2.7.1 Axis of curl parallel to the grain of the paper: 0.12 inch.

2.7.2 Axis of curl at right angles to the grain of the paper: 0.25 inch.

2.7.3 Axis of curl diagonal to the grain of the paper: 0.25 inch.

3. Paper Requirements

3.1 Composition. The paper shall be 100 percent chemical wood fiber; no ground wood allowed. (See 4.3.)

3.2 Basis Weight. The paper shall weigh 99 pounds ± 5 percent per ream of 500 sheets, 24 inches × 36 inches. (See 4.4.)

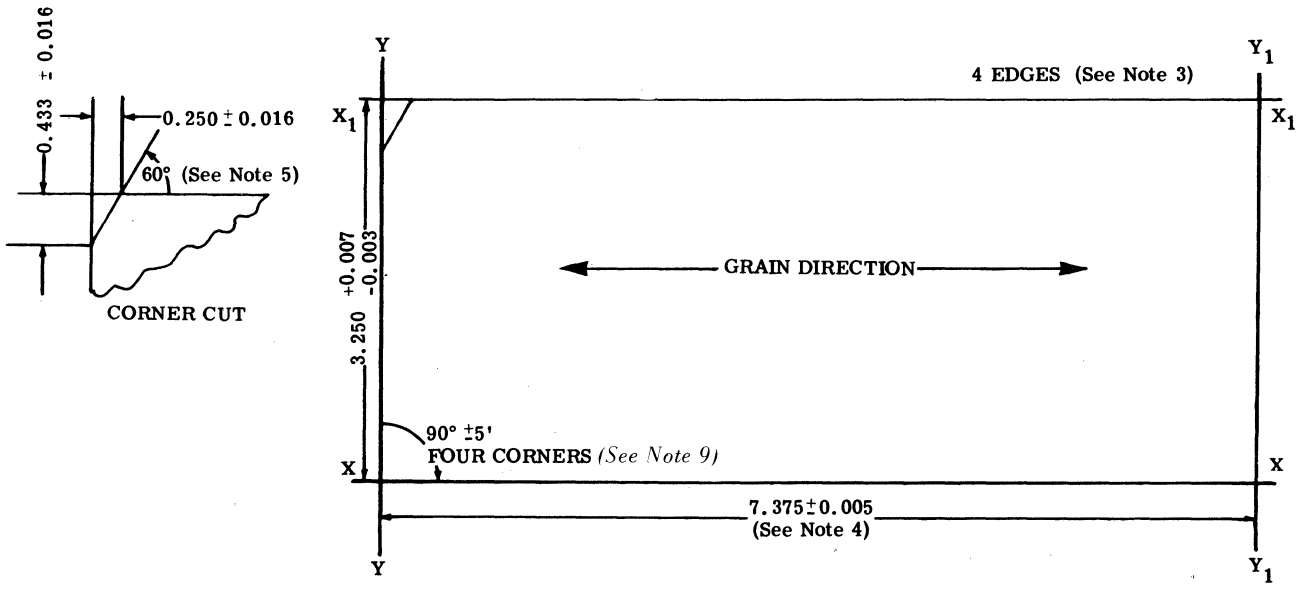

Fig. 1
Paper Card for Information Processing

NOTES:

(1) XX Parallel to X_1X_1 within 0.003.
(2) YY Parallel to Y_1Y_1 within 0.003.
(3) Straight within 0.003.
(4) Length of base, *not* overall length.
(5) For reference use only.
(6) Card thickness 0.0070 ±0.0004
(7) All linear dimensions in inches.
(8) Dimensions stated for cards conditioned at 50 percent relative humidity and 73°F (see Section 2 and 4.1).
(9) ±5 minutes = 0.0047 deviation at 3.2500.

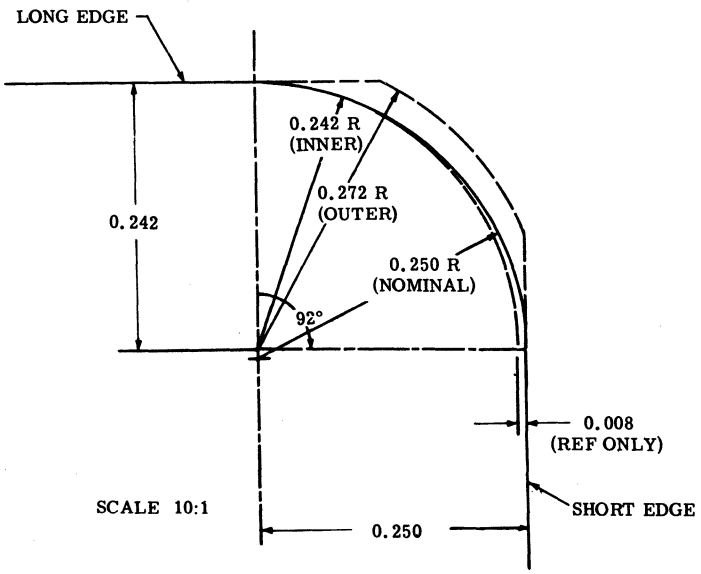

Fig. 2
Rounded Corner

3.3 Thickness. The thickness shall be 0.0070 inch ±0.0004 inch. (See 4.5.)

3.4 Bursting Strength. The minimum bursting strength shall be 55 psi (pounds per square inch). (See 4.6.)

3.5 Stiffness. The stiffness shall be as specified by either of the following (since results of either instrument are satisfactory, testing by both is not necessary):

3.5.1 The minimum Taber stiffness in the grain direction shall be 17.0 g-cm (gram-centimeters) and in the cross direction shall be 8.0 g-cm. (See 4.7.1.)

3.5.2 The minimum Gurley stiffness in the grain direction shall be 1200 mg and in the cross direction shall be 500 mg. (See 4.7.2.)

3.6 Folding Endurance. The minimum average M. I. T. folding endurance shall be 100 double folds in each direction. (See 4.8.)

3.7 Internal Tearing Resistance. The minimum resistance to tear in each direction shall be 125 grams. (See 4.9.)

3.8 Ash. The ash content shall not exceed 2.0 percent. (See 4.10.)

3.9 Hydrogen Ion Concentration. The pH by the hot extraction method shall not be below 5.0. (See 4.11.)

3.10 Frictional Characteristics

3.10.1 The static coefficient of friction shall be between 0.30 and 0.45.

3.10.2 The kinetic coefficient of friction shall not be less than 75 percent of the static coefficient of friction. (See 4.12.)

3.11 Expansion and Contraction. Maximum expansion and contraction with 20 percent to 75 percent and 75 percent to 20 percent change in relative humidity shall be:

3.11.1 Grain direction: 0.25 percent

3.11.2 Cross direction: 0.70 percent

(See 4.13.)

3.12 Writing Quality. The paper shall be suitable for writing with pen and ink. (See 4.14.)

3.13 Smoothness (Roughness). The roughness shall be as specified by either of the following (since results of either instrument are satisfactory, testing by both is not necessary):

3.13.1 The average Sheffield roughness on each side of the paper shall not exceed a reading of 125 Sheffield's. (See 4.16.1.)

3.13.2 The average Bekk roughness on each side of the paper shall not be less than 40 seconds and shall not exceed 100 seconds. (See 4.16.2.)

3.14 Abrasion Loss (Resistance to Abrasion). The loss of weight from each side of the paper shall not exceed 50 milligrams when tested according to 4.17.

4. Testing Methods

Unless otherwise specified, the following tolerances shall apply:

Relative Humidity	±2 percent rh
Temperature	±3.5°F

4.1 Conditioning. Unless otherwise specified, tests for physical requirements shall be performed on cards conditioned at 50 percent rh and 73°F by TAPPI (Technical Association of the Pulp and Paper Industry) method T 402 m-49.

4.2 Curl of Cards. This test is performed at 20 percent rh and at 75 percent rh. In each case, the temperature is maintained at 73°F. A deck of 10 cards is laid on a smooth, horizontal surface with the wire side of the paper up. A similar deck is laid on a smooth, horizontal surface with the felt side of the paper up. After 24 hours, the cards are examined and, if necessary, the deck is turned so that the concave side of the deck is up. A straight edge, weighing 2.5 ± 0.1 grams, is placed across the two high points of the deck of cards. The amount of curl is then measured from the bottom of the straight edge to the low point of the top card of the deck. The test should be performed with separate decks at 20 percent rh and at 75 percent rh, though the deck used at 20 percent rh may later be used at 75 percent rh. The cards tested at 75 percent rh shall not, however, later be tested at 20 percent rh.

4.3 Composition. The fiber composition shall be determined by TAPPI method T 401 m-60.

4.4 Basis Weight. Weight shall be determined by TAPPI method T 410 os-61.

4.5 Thickness. Thickness shall be determined by TAPPI method T 411 m-44.

4.6 Bursting Strength. Bursting strength shall be determined by TAPPI method T 403 ts-63.

4.7 Stiffness

4.7.1 Taber stiffness shall be determined by TAPPI method T 489 m-60.

4.7.2 Gurley stiffness shall be determined by Gurley method given by the manufacturer of the testing instrument, using 2-inch by 2½-inch specimens.

4.8 Folding Endurance. Folding endurance shall be determined by TAPPI method T 423 m-50, Method II (M.I.T. testing instrument).

4.9 Internal Tearing Resistance. Tearing resistance shall be determined by TAPPI method T 414 ts-65.

4.10 Ash. Percent ash shall be determined by TAPPI method T 413 ts-66.

4.11 Hydrogen Ion Concentration. Hydrogen ion con-

centration shall be determined by TAPPI method T 435 m-52, Hot Extraction.

4.12 Coefficient of Friction. The instrument for performing this test shall consist of a smooth, level, metal plate to support the cards, a 3 × 3-inch 1,000 gram weight, a 1,000 gram capacity Chattilon push-pull gage calibrated for horizontal use, and a motor-driven mount for the gage which can advance the gage horizontally and steadily at the rate of 3 feet per minute. The bottom of the weight shall have a smooth, clean rubber surface.

In performing the test, eleven properly conditioned cards, which have been handled by their edges only, are laid flat on the metal plate with the left end of the cards against a stop. The top card is advanced to the right about 2 inches and the weight is placed on the cards, near the right end, so that it is supported by all cards. The gage is then advanced toward the left so that it pushes against the weight in the direction of the long axis of the cards. A reading is taken when the weight and the top card move. This reading, in grams, divided by 1,000 is the static coefficient of friction. Ten successive readings are taken by sequentially placing the top card on the bottom of the deck and repeating the procedure. If, as the movement of the weight and top card continues, there is a change in the reading, the new reading, in grams, divided by 1,000 is the kinetic coefficient of friction.

4.13 Expansion and Contraction. Expansion and contraction tests are made by exposing cards sequentially to 20 percent, 75 percent, and 20 percent rh at 73°F. These cards shall remain fully exposed for a minimum of two hours at each humidity. The cards are then measured with a precision of ± 0.0005 inch. The percent expansion is calculated from the difference between the original measurement at 20 percent rh and that made at 75 percent rh. The percent contraction is calculated from the difference between the measurement at 75 percent rh and final measurement at 20 percent rh. If the relative humidity, as measured with a wet and dry bulb psychrometer, is not exactly 20 percent and 75 percent, but within the specified tolerance, corrections are applied assuming a straight line relationship between relative humidity and card dimensions.

4.14 Writing Quality. A clean, unhandled sample of the paper shall be written upon in a normal manner on both sides using a pen with a firm, medium point.[1] The ink used[2] shall be prepared by dissolving 2 grams of C.I. Acid Red 1, (C.I. 18050) or 2 grams of C.I. Acid Green 3, (C.I. 42085) in 100 cc of distilled water heated to 100°F. The surface tension of the ink shall be tested at 73° ± 1°F using a Traube stalagmometer.[3] Reduce the surface tension by adding a wetting agent[4] until 105 to 110 drops fall while the level of the liquid descends from the upper to the lower encircling marks. The written material shall be dry to the touch within 10 seconds. The lines or characters shall be clear-cut and legible, without excessive feathering or spreading.

4.15 Card Dimensions. All measurements shall be made between parallel anvils having flat contacting surfaces between $\frac{3}{16}$-inch and $\frac{3}{4}$-inch long and contacting pressures between 20 and 40 grams.

4.16 Smoothness (Roughness)

4.16.1 Sheffield smoothness shall be determined by TAPPI method RC-285.

4.16.2 Bekk smoothness shall be determined by TAPPI method T 479 sm-48.

4.17 Abrasion Loss (Resistance to Abrasion). Abrasion loss shall be determined by TAPPI method T 476 ts-63, Procedure 1, Dry Abrasion Test, except that the turntable of the abrading instrument shall make exactly 100 revolutions.

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[1] Esterbrook point No. 9668 or equivalent.

[2] Sheaffer's Skrip, No. 22 permanent blue-black ink or equivalent may be substituted.

[3] Fisher Scientific No. 5-945 or equivalent.

[4] A 25 percent solution of clear Aerosal OT (approximately 2 drops).

Appendix

(This Appendix is not a part of the American National Standard Specification for General Purpose Paper Cards for Information Processing. X3.11-1969.)

A1. Recommended Storage and Handling Procedures

Maximum reliability of cards will be maintained by complying with the storage and handling procedures recommended in this Appendix.

A2. Importance of Environment

Cards are affected by heat, cold, and most significantly, relative humidity. Variations in temperature and humidity alter the physical and dimensional characteristics and will reduce the reliability of the card as an information interchange medium. A uniform relative humidity (between 30 percent and 65 percent) is recommended. Even within this range, abrupt changes should always be avoided. Therefore, cards should not be stored where they are exposed to such changes, such as near heated pipes, radiators, windows, and air ducts.

A3. Operating Conditions

Even when relative humidity is not ideal (50 percent rh and 73°F) cards will usually perform satisfactorily if given time to acclimate. However, cards exposed to sharp differences in relative humidity, such as encountered when moving cards from the storage area to the working area, may become temporarily or permanently warped. As used herein, the term "warp" includes "waviness."

When humidity is high, moisture is absorbed by the cards causing them to swell in length, width, and thickness. When humidity is low, cards lose moisture, shrink in all dimensions, and tend to warp.

Cards transferred from a cold room to a warm room may collect moisture and develop temporary warp. Such cards must be given ample time to achieve a moisture balance with the machine room environment.

If space permits, storage facilities should be provided in the working area for a five- to ten-day supply.

Caution should be exercised in regulating thermostats and opening windows in working areas.

In winter, favorable relative humidity conditions are more easily maintained at lower temperatures, as continuous high heat dries the air and reduces relative humidity levels.

In summer, excessive humidity can be offset by the use of dehumidifiers.

A4. Warp Correction

Mechanical warp is caused by poor storage or operating procedures. Stacking of partially filled cartons may crush the cards, while storing cartons in damp places may cause cards to become swollen and cramped in their containers. If not too severe or of long duration, mechanical warp may be corrected by storing cards under pressure within the recommended relative humidity (30 percent to 65 percent).

Temporary warp is a common cause of card feeding problems. It is generally caused by exposure to abrupt changes in relative humidity. Provided the humidity is within recommended levels, temporary warp will usually disappear as soon as the cards reach a moisture balance with their new environment.

Cards may become permanently warped if they have been exposed for an extended period of time outside the recommended humidity range (30 percent to 65 percent), and cannot be easily corrected.

Inherent warp is very rarely excessive. Once cards have been exposed to extreme levels of humidity, the warp is magnified and cannot be corrected.

A5. Conditioning

The time required for cards to become sufficiently acclimated to the machine room atmosphere and perform properly depends primarily on the difference between the relative humidity of the machine room and the moisture content of the cards. The following table applies to cards packed in open containers such as 2,000-card boxes or trays:

Difference in Relative Humidity	Minimum Time Required for Conditioning
±10 percent	1 day
±20 percent	10 days
±30 percent or more	15 days

A6. Card Handling

Cards should be flat for machine feeding. Slight distortions can generally be eliminated by lightly fanning the cards.

A7. Storage Procedures

Cartons of cards should be stacked upright. They should not be placed directly on the floor, but should be squarely supported at the bottom and not stacked more than three high.

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X3.1-1969	Synchronous Signaling Rates for Data Transmission
X3.2-1963	Print Specifications for Magnetic Ink Character Recognition
X3.3-1963	Bank Check Specifications for Magnetic Ink Character Recognition
X3.4-1968	Code for Information Interchange
X3.5-1968	Flowchart Symbols and Their Usage in Information Processing
X3.6-1965	Perforated Tape Code for Information Interchange
X3.9-1966	FORTRAN
X3.10-1966	Basic FORTRAN
X3.11-1969	Specifications for General Purpose Paper Cards for Information Processing
X3.12-1970	Vocabulary for Information Processing
X3.14-1969	Recorded Magnetic Tape for Information Interchange (200 CPI, NRZI)
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